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Girls Dominate, Boys Left Behind: Decomposing the Gender Gap in Education Outcomes in Jamaica*

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Abstract

This paper utilizes administrative data to investigate the gender gap in high school performance on various high-stakes exams and the gender disparity in academic outcomes at the leading university in the Caribbean. The results show that female students outperformed their male peers, being 8.5 and 6.6 percentage points more likely to pass a generic subject in the Caribbean Secondary Education Certificate (CSEC) and Caribbean Advanced Proficiency Examination (CAPE) exams, respectively. These results are robust across subject type, school ownership, school rank, and subject difficulty. Additionally, more females are admitted to each degree program annually, and they continue to outperform males regardless of age, enrollment status, or admission scores. The Blinder-Oaxaca decomposition indicate that school attributes, subject-cohort composition, and subject choice explain up to 78% of the gender gap in CSEC and CAPE pass rates, while college readiness, college-level decisions, and field of study fully explain the gap in college GPA.

Keywords: Gender Achievement Gap, Academic Performance, High-Stakes Exam, STEM
JEL Codes: I21, I24, J16, J24, N36

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1. Introduction

The disparities in human capital investment and academic outcomes across gender have long been a central focus of education research.[1] On the one hand, some studies have found that females are generally at an academic disadvantage, especially in STEM subject areas (Ellison & Swanson, 2023; Evans, Akmal, & Jakiela, 2020; Van Langen, Bosker, & Dekkers, 2006). On the other hand, several recent studies have documented a significant shift toward gender parity in educational attainment, and in some cases, a gender gap reversal where females are now outperforming their male peers in subject areas that were once male dominated. For instance, Reardon, Fahle, Kalogrides, Podolsky, and Zárate (2019) found that while females and males now have the same SAT math performance, females have maintained a slightly better performance in SAT english language arts. Similarly, some studies have found a female advantage in college persistence and graduation rates (Bae, 2000; DiPrete & Buchmann, 2006; Goldin, Katz, & Kuziemko, 2006). Bossavie and Kanninen (2018) argues that the gender gap reversal in educational outcomes is now a global phenomenon, affecting the majority of higher-income countries and a rapidly growing proportion of lower-income countries.[2] While numerous studies have explored the gender gap in educational outcomes in developed countries, this issue remains understudied in developing countries, particularly in the Latin America and Caribbean region.

This paper examines the gender gap in high school students' performance on various high-stakes exams using administrative data on all Jamaican students who completed one or more subjects in the Caribbean Secondary Education Certificate (CSEC) and the Caribbean Advanced Pro-

[1] These studies have underscored the complex nature of gender inequality in education, examining how various factors such as socio-economic background, cultural norms, teacher characteristics, differences in aspirations, academic competition, and systemic discrimination contribute to disparate educational outcomes between genders (Bossavie & Kanninen, 2018; Carrell, Page, & West, 2010; Conger & Long, 2010; Gevrek, Gevrek, & Neumeier, 2020; Holmlund & Sund, 2008; Lundberg, 2020; Niederle & Vesterlund, 2010).

[2] In their study of 146 countries, Bossavie and Kanninen (2018) found that females tend to outperform males in secondary school completion in around 71% of the countries analyzed. Furthermore, they observed that the reversal of the gender gap in tertiary enrollment is most pronounced in advanced economies, with a rate of 92%, and lowest in Sub-Saharan Africa, where it stands at 38%. See Evans et al. (2020) for an overview of gender gaps in low- and middle-income countries between 1960 and 2010. Himaz and Aturupane (2021) provides just one example of the gender gap reversal in a developing country.

ficiency Examination (CAPE) assessments that are administered by the Caribbean Examinations Council (CXC). Additionally, using administrative student-level data from The University of the West Indies, this study examines the gender disparity in the academic outcomes of Jamaican students attending this leading Caribbean university. In each case, the Blinder-Oaxaca Decomposition is also employed to determine the proportion of the gender gap that can be explained by observable students decisions and institution-level covariates (Blinder, 1973; Jann, 2008; Oaxaca, 1973).

This study makes several notable contributions to the existing literature on gender disparity in academic outcomes. First, this is one of the foremost studies to use administrative student-level data to examine the gender gap in high school students performance in a developing country and to document the degree to which male students are falling behind as they advance to university. The existing studies in the literature have utilized national surveys or aggregated secondary data to describe country-level trends, often focusing on single-subject case studies or performing comparative analyses on the gender achievement gap across countries. As such, these studies did not examine the student- or school-level factors that contribute to the gender gap in academic outcomes, thereby failing to investigate the nuanced factors contributing to these disparities (Abdulkadri et al., 2022; Bailey, 2009; Buitrago-Hernandex, Levin, & Castelan, 2023; Duryea, Galiani, Ñopo, & Piras, 2007; Thailinger et al., 2023). This study advances the literature by using big data containing millions of student-level observations to analyze the gender differences in student performance across multiple subjects in two high-stakes exams that are required for entry to university.

Second, this study broadens the literature by exploring how various student decisions and school-level covariates explain the gender gap in high school performance. Furthermore, the study examines how past academic preparation, college-level course selection, and major choice explain the gender gap in first semester GPA. These contributions are important because they provide new insights into the evolution of the gender gap as students progress through the education system. Additionally, due to the detailed data utilized, this study is one of the first to decompose the factors that contribute to the gender gap in student performance on various high-stakes assessments at various educational levels. This information is crucial for policymakers who seek to create and implement targeted policies to achieve gender parity in educational outcomes.

There are several potential explanations for gender differences in academic outcomes at the secondary and tertiary levels.[3] However, while these explanations are plausible, gender disparities in educational investments largely reflects a complex interaction of economic, social, and cultural factors that is not yet fully understood. First, some studies have shown that access, income constraints, and price play a crucial role in shaping educational opportunities (Asante, 2022; Blimpo, Gajigo, & Pugatch, 2019; Obasi, 1997; Root, 2007). For instance, Root (2007) found that eliminating school fees for primary and middle school students in Tanzania, Kenya, and Uganda had a significant positive effect on primary school enrolment, especially for girls. Similarly, Blimpo et al. (2019) found that a large-scale fee elimination for secondary school girls in The Gambia increased the number of girls taking the high school exit exam by 55% and yielded performance gains for both boys and girls. These results show that economic constraints can significantly impact the gender gap in education access and academic outcomes.

Second, parental preferences for children of different genders may also affect schooling investments (Barcellos, Carvalho, & Lleras-Muney, 2014; Cronk, 1991; Kornrich & Furstenberg, 2013). Such preferences may cause low-income households to make differential educational investments across genders. In addition, Alderman and King (1998) and Pasqua (2005) show that parents may also invest differently in their children based on their gender because of the perceived differences in the costs and return on investments, as exemplified by the gap in males and females labor market earnings. As such, when young boys are expected to help bring in additional income to the family, it may be cheaper to invest in girls' education since the opportunity cost of investing in boys is too high. On the other hand, if there is gender discrimination against women in the labor market, then it may be more beneficial to invest in boys education because they will yield a higher net return. In the Caribbean region, parental expectations and notions of masculinity often results in boys being pressured to work and contribute to the family income as soon as they are able, leading to higher

[3]See Thailinger et al. (2023) for a detailed review of the literature on the factors that may explain the gender gap in students outcomes. See Alderman and King (1998) and Pasqua (2005) for simple theoretical models of how gender-specific rates of returns to education and parental preferences may lead to differential investment in children by gender. Glick (2008) discusses the effect of various policies on educational gender gaps in developing countries.

rates of school absences and dropout (Gayle, 2002; Thailinger et al., 2023). Furthermore, these studies have argued that low-performing boys usually belong to low-achieving environments, such as disadvantaged schools or impoverished areas.

Lastly, cultural norms and societal expectations may affect how students invest in educational activities (e.g. class attendance, attention, subject choice, etc). These constraints can influence students' academic aspirations and shape perceptions of their capabilities and career options. In the Caribbean, boys are often given more freedom and are expected to be active and independent, while girls are typically more supervised, encouraged to read, and help around the house. These early socialization patterns teach girls skills such as obedience and cooperation which improves their academic outcomes, while boys' less structured upbringing leaves them ill-prepared for the disciplined school environment.[4] Boys are also socialized to embrace a hyper-masculine identity that is centered on physicality, risk-taking, and economic prowess (Plummer, 2010).[5] As such, in this setting, males are discouraged from pursuing majors and careers that are traditionally associated with women, which limits their academic and professional options. Furthermore, since academic success is associated with femininity in some Caribbean countries, this may pressure young men to devote less time to their academic pursuits to avoid the negative stereotypes associated with academic success (Cobbett & Younger, 2012; Plummer, 2010).[6] As such, boys may struggle in school as academic achievement is often viewed as conflicting with traditional masculine ideals. Similarly, girls may face barriers to pursuing certain STEM subjects or non-traditional career paths due to cultural stereotypes and biases.

This paper documents several interesting findings about the gender disparity in educational out-

[4]Teachers use negative adjectives (noisy, lazy, & disruptive) to describe boys' attitudes inside the classroom and positive adjectives (attentive & serious) to describe the attitudes of girls (Parry, 2000).

[5]This may explain why boys are more likely to choose STEM subjects - traditional seen as more challenging and more closely aligned to higher paying male-dominated careers (Ogunkola & Garner-O'Neale, 2013; Thailinger et al., 2023).

[6]Boys who achieve academic success risk being considered 'suspect' by their peers, having their masculinity questioned, and being ridiculed by their peers (Plummer, 2010). Consequently, the number of males in the classroom and the dynamics of male interaction appears quite important. In particular, Jackson (2021) found that males in Trinidad and Tobago performed better when their low-performing secondary schools transitioned from coeducational to single-sex. This suggests that males may benefit when they belong to a classroom environment with a higher proportion of male students.

comes in Jamaica. First, female students outperformed their male peers in both standardized high school exit exams. In particular, female students were 8.5 and 6.6 percentage points more likely to pass a generic subject in the CSEC and CAPE exams, respectively. These results are consistent in sub-group analysis conducted by subject type, school ownership, school rank, and subject difficulty. The data also suggests that each year, the majority of incoming students admitted to the leading university in the Caribbean are female, and regardless of the age at entry, enrollment status, or admission scores, female students continue to outperform their male peers at this level. Using the Blinder-Oaxaca decomposition, I found that various school level attributes, class composition, and subject choice covariates explain up to 78% of the overall gender gap in CSEC and CAPE pass rates. Similarly, the results show that college readiness, college-level decisions, and field of study fully explain the difference in college GPA across gender. These findings demonstrate that in some countries in the Caribbean region, males are accumulating human capital at a significantly lower rate than females.

2. The Jamaican Education System

Jamaican students begin their formal education with primary school entry at age six. They must then complete six years of compulsory education, covering grades 1 to 6. At the end of grade 6, students must sit the national high school placement exam which was known as the Grade Six Achievement Test (GSAT) prior to 2018 and the Primary Exit Profile (PEP) thereafter.

2.1. Primary Education: GSAT and PEP

The GSAT assessment, which is comprised of exams in english language, social studies, science, mathematics, and communication task, served as the benchmark for high school placement before 2018. However, in 2018, Jamaica transitioned to the Primary Exit Profile (PEP) as the new national placement exam, replacing the GSAT for the 2018-19 academic year and beyond.[7] The PEP con-

[7]Ministry of Education (2017) notes that the key difference between GSAT and the PEP exam is that "GSAT focused primarily on content and assessing student knowledge of the subject area, whereas PEP foundations are built

sists of three key components (i) a Performance Task (PT) which consists of real world scenarios that require students to apply their knowledge and skills from Mathematics, Science, Language Arts, and Social Studies and is administered in grades 4 to 6 by their teachers at school; (ii) an Ability Test that is not based on the taught curriculum and require students to read analytically and use quantitative reasoning skills in their response; and (iii) a Curriculum Based Test (CBT) that assess grade 6 content only, in the areas of Mathematics, Science, Social Studies, and Language Arts. This test is comprised of multiple choice items and is administered close to the end of Grade 6 (Ministry of Education, 2017).[8]

Each student sitting the PEP exam must identify the seven high schools they would like to attend, ranked in order of first preference. Under both the GSAT and PEP assessments, students are first ranked based on their overall performance and then sorted to their high school of choice based on their rank and each high school capacity. The students who are unable to be assigned one of their seven choices are then sorted to a high school based on proximity (Ministry of Education, 2018). The ministry's data shows that the overwhelming majority of students received one of their seven choices.[9] Using exam records from 2003 to 2015, Beuermann, Bonilla, and Stampini (2024) found that girls outperformed boys by 0.46 standard deviations (sd) on the GSAT exam and were granted their desire to attend more selective high schools. On average, the incoming high school peers of girls scored 0.27 sd higher on the GSAT exam than those attended by boys. his indicates that female primary school students are more likely to be placed at higher-ranked (quality) high schools, which may contribute to the disparity in high school performance.

on the notion that competency involves both student knowledge and what a student is able to do with the knowledge they possess."

[8]The Primary Exit Profile (PEP) assigns weights to its components as follows: Curriculum Based Test contributes 50%, Ability Test 30%, and Performance Task 20% (with 5% at grade four, 7% at grade five, and 8% at grade six). The transition from GSAT to PEP had several advantages: (i) it broadened the number and type of assessments, (ii) included both a subject-based and cognitive ability test, (iii) it credited students for their performance in earlier grades, and (iv) it reduced the weight of the high-stakes subject-based test on student's placement.

[9]If high school quality is observed by parents and students, this sorting mechanism ensures that similarly performing boys and girls are assigned to the same schools, conditional on their performance rank and preferences. As such, if boys' and girls' grades are similarly distributed, then average ability would also be similarly distributed across genders at each high school, assuming high school preferences are based on observed quality. However, if there are significant gender gaps in academic performance at the primary school level, this allocation mechanism potentially preserves these gaps as students transition to high school. While we proxy for motivation in the CSEC results and control for past performance for the CAPE and university analysis, PEP grades are unobserved in this study.

2.2. The High School System

The Jamaican secondary education system is typically divided into three segments that cover seven calendar years: lower secondary (grades 7-9), during which students engage with a general curriculum across various subjects; upper secondary (grades 10-11), where students study about eight core subject areas and prepare for the corresponding Caribbean Secondary Education Certificate (CSEC) exams; and sixth form extension programs (grades 12-13), where students prepare to sit the Caribbean Advanced Proficiency Examination (CAPE), which is required for admission to certain university programs.

Upon completing upper secondary school, students may opt to take the CSEC examination, which covers 33 subject areas and is administered by the Caribbean Examination Council (CXC). To sit an exam at most high schools, students need a recommendation from their subject teachers, who base their recommendations on students' performance in class assessments and their potential for success in the external exams. While entry-level positions and university admission typically require at least five CSEC subjects, including English Language and Mathematics, the data indicate that the median student takes about three subjects, and students at the 75th percentile take about five subjects. All CSEC exams are scored on a six point discrete scale, where scores I, II, III, IV, V, and IV represent an outstanding, good, fairly good, moderate, limited, and very limited standard of performance, respectively. Based on guidance from the Caribbean Examination Council, a score between I and III indicates that the student has successfully passed the subject, while any other score suggests otherwise.[10]

After completing the CSEC exams, students who intend to pursue higher education studies may opt to take the Caribbean Advanced Proficiency Examination (CAPE). These exams are also administered by the Caribbean Examinations Council.[11] The CAPE exam is designed for students

[10]There are other outcomes that may be reported to the student including absent (ABS) and ungraded due to a component being missing (UNG). Together, these results were assigned to about 5% and 2% of all subjects taken, respectively.

[11]After graduating from secondary school, students can apply for a sixth form extension program to take classes for the CAPE exam. These programs are offered by the majority of high schools in Jamaica and tend to be very competitive. Based on their CSEC scores, students may choose to apply to a higher-ranked sixth form program, stay at their current institution, or attend a lower-quality program.

who have completed the CSEC exams and wish to pursue advanced studies in specialized subject areas to improve their likelihood of acceptance to university and their eligibility for scholarships. It covers a range of subjects organized into two units per subject, each unit being designed as a one-year course. Since most university admissions and higher-level entry positions require at least two double units of the CAPE exam, data indicates that 18% of students take 3 units or less, 61% of students take 4 units as recommended by most high schools, and about 21% of students take 5 or more units each year.[12]

Beuermann et al. (2024) found that among female students who completed the GSAT exam, 73% and 16.9% went on to complete at least one subject in the CSEC and CAPE exams, respectively. The corresponding rates for boys was 53% and 9%. This finding suggests that conditional on high school placement, females are more likely to take the CSEC and CAPE exams. This selective outcome is important as it indicates that the composition and attributes of test-takers are crucial variables that may influence the gender gap in academic achievement.

2.3. Higher Education

While there are several colleges and universities in Jamaica, The University of the West Indies (UWI) stands out as the oldest and most prestigious institution. The UWI has a long-standing history of academic excellence and has been ranked the leading university in the Caribbean.[13] The UWI has a student population of nearly 50,000 students across five campuses throughout the English-speaking Caribbean: Mona in Jamaica, Cave Hill in Barbados, St. Augustine in Trinidad and Tobago, Five Islands Campus in Antigua and Barbuda, and the UWI Global Campus.[14] This study focuses on Jamaican students who were enrolled at the Mona campus between 2006 and

[12]Each CSEC and CAPE subject evaluate student performance using multiple assessments. These components include a multiple-choice exam (Paper One), a written exam featuring short-answer, long-answer, or discussion questions (Paper Two), and a School-Based or Internal Assessment (SBA/IA) that is submitted well in advance and evaluated by the student's teacher. Typically, the written exam has the highest weight among the three components. Of the 34 CSEC subjects offered, 19 have an SBA weight of less than 30%, and only 3 have an SBA weight exceeding 40%.

[13]The Times Higher Education (THE) ranks the University of the West Indies as number 1 in the Caribbean and number 25 in the Latin America and Caribbean region (Times Higher Education, 2024; UWI, 2021).

[14]The Global campus, formerly known as the Open Campus, is a virtual campus with over 42 physical site locations in 17 Countries across the region.

2016.

The Mona campus, established in 1948, was the first UWI campus. It offers over 200 undergraduate and postgraduate programs across 38 departments and seven faculties, including Humanities and Education, Sport, Science and Technology, Engineering, Medical Sciences, Social Sciences, and Law.[15] To be eligible for entry to an undergraduate degree program, the university typically requires students to pass at least five CSEC subjects and two double units of the CAPE exam or to possess equivalent international qualifications. However, some degree programs, such as law or medicine, are highly competitive and require students to secure more than the minimum number of subjects and higher quality passes in both exams to be a strong candidate for entry.

2.4. Data

This study utilizes student-level data from two primary sources. First, the study obtained administrative data from the Ministry of Education which provides comprehensive information on the students who completed the Caribbean Secondary Education Certificate (CSEC) examination between 2012 to 2023 and the Caribbean Advanced Proficiency Examination (CAPE) between 2012 to 2016. These records contain 2.46 million observations at the student-by-subject level and cover several important variables, including students' identification numbers, examination year, school code, gender, and the results for each subject the student registered to take.[16] This data was used to create several additional student- and school-level covariates, including the number of subjects taken by each student, subject-level cohort size at each school, school rank, the gender composition of each subject cohort, subject difficulty, and dummy variables for passing, obtaining the highest possible score (Grade 1), and being absent on exam day. These records were then merged with other school-level covariates, such as school location, school ownership, a binary variable indicating co-educational institutions (1) versus single-sex schools (0), and a binary variable indicating whole-day schools (1) versus schools on the shift system (0). The descriptive statistics for

[15] The Sport and Engineering faculties were established after 2016.

[16] The sample includes 521,811 students over the study period. Female students made up about 57.48% of test takers and they sat 59.2% of the CSEC subjects taken. The average student completed approximately 4.719 subjects. Consequently, the data contains 2.46 million observations at the student-by-subject level.

the main variables in the CSEC and CAPE analysis are presented in Table 1 and Table A1 of the Online Appendix, respectively.[17] For each covariate, both tables also show the mean differences across gender and the corresponding standard errors.[18]

Secondly, this study uses administrative data from The University of the West Indies which included all students enrolled over the period 2006 to 2016. Focusing on incoming students in their first semester outcomes, the dataset is comprised of 32,045 student-level observations. The data include details on the number of credits attempted, core credits attempted, enrollment status, commuting status, age, admission score, CSEC and CAPE performances, field of study, tuition, grade regulation changes, the share of male in each major-by-cohort cluster, GPA, and graduation date. The descriptive statistics for entering students are presented in Table 6. These statistics are presented for females and males in columns 1 and 2, respectively, and the mean difference in covariates and corresponding standard errors are both presented in column 3.[19]

3. Exploring the Gender Gap in High School Performance

A simple regression model is utilized to estimate the gender gap in student performance:

$$P_{ist} = \beta_0 + \beta_1 \text{Male}_i + \epsilon_{ist},$$

where the subscripts i, s, and t indexes student, subject, and exam year. The dependent variable P_{ist} represent various measures of student performance on the CSEC exam, namely three binary variables for passing the exam, obtaining the highest possible score, and being absent on exam day. The variable Male_i is a binary variable that takes the value 1 if the student is male and 0 if the student is female, and ϵ_{ist} is the error term representing the omitted factors that may impact students' performance. In this simple model, β_1 is the raw average difference in the performance

[17] See Online Appendix B for a detailed description of how the derived variables were created and what they are expected to capture.

[18] These mean differences are utilized in the Blinder-Oaxaca Decomposition discussed in the results section.

[19] While the years for which the CSEC, CAPE, and UWI data are available do not exactly match, there is sufficient overlap to estimate the gender gap in student outcomes at various levels of the education system in recent years and to identify the covariates that best explain this disparity. This is the main objective of this study.

of male and female test takers or the unadjusted gender gap.

3.1. The Gender Gap in CSEC Outcomes

Table 2 shows the unadjusted gender gap in students performance on the CSEC exam for the overall sample and heterogeneous results by school rank, school ownership, subject choice, and subject difficulty. The standard errors in each model are two-way clustered at the subject-by-year level. The results in column 1 suggest that across all subjects, male test-takers are about 8.5 percentage points less likely to pass the CSEC exam. Similarly, male students were 4.6 percentage points less likely to receive the highest possible score (grade 1) and about 4.1 percentage points more likely to be absent on exam day. As such, female students generally outperform their male counterparts on the CSEC exam, evidenced by lower absenteeism rates, higher pass rates, and an increased likelihood of achieving the highest possible score.[20]

Next, columns 2 and 3 show the gender gap in student outcomes at high-ranked and low-ranked schools. Schools are classified as high-ranked if their historical pass rate across all subjects is higher than the median, and low-ranked otherwise. The estimates suggest that the gender gap in CSEC performance is most pronounced at higher-ranked schools compared to lower-ranked schools. Specifically, males at better-performing schools were 9.0 percentage points less likely to pass and 6.1 percentage points less likely to achieve the highest possible score in a generic subject. Conversely, at low-performing schools, males were 6.3 percentage points less likely to pass and only 0.2 percentage points less likely to obtain the highest score. However, male students exhibited more absenteeism at lower-performing schools.[21]

The results in columns 4 and 5 show that males performed far below their female peers at both government and privately owned institutions. In particular, at government-owned schools,

[20]Figure 1 shows that female students outperformed male students in all 33 CSEC subjects, with at least 31 of these differences being statistically significant.

[21]One plausible explanation for these results is that cultural norms in Jamaica often portray girls as better suited for academic success. As such, teachers at high-performing schools might unconsciously hold these biases, expecting girls to excel academically and boys to struggle (Parry, 2000; Thailinger et al., 2023). These expectations can influence how teachers interact with and support students and how boys approach their studies, leading to larger gender gaps at better schools. In contrast, academic expectations are generally lower at poorly performing schools, which reduces the influence of gender expectations.

males were 8.6 percentage points less likely to pass and 2.9 percentage points less likely to achieve the highest possible score in a generic subject. Similarly, the males attending privately operated schools were 8.2 percentage points less likely to pass and 7.3 percentage points less likely to achieve the highest possible score in a generic subject. Lastly, the results in columns 6 to 9 suggest that the gender gap is smaller for STEM and harder subjects, but larger for non-STEM and easier subjects. A subject is classified as hard if it's historical pass rates is below the median pass rate at the subject-level, and easy otherwise. The results suggest that relative to female test-takers, males are 11 and 8.2 percentage points less likely to pass a non-STEM or easier subject, but 3.7 and 6.4 percentage points less likely to pass a STEM or harder subject.[22] These results suggest that there is greater gender parity in performance in STEM and other challenging subjects. This result aligns with studies in the literature that have found that unlike their female peers, males are more willing to compete and tend to perform better in more competitive environments (Gneezy, Niederle, & Rustichini, 2003; Lovasz, Bat-Erdene, Cukrowska-Torzewska, Rigó, & Szabó-Morvai, 2023).[23]

3.2. The Conditional Gender Gap in CSEC Performance

In this section, I investigate how school-level attributes, the composition of test-takers, and students' subject selection behavior affect the gender gap in pass rates. These variables were selected because they are factors that the government can readily adjust to improve gender parity, and they are readily available in the data.

To assess the importance of each variable group, the analysis uses a simple horse-race approach. This approach involves estimating the simple regression model outlined above and sequentially adding each group of covariates to observe their individual and combined effects on the gender

[22] In fact, across all sub groups, the gender gap is larger when the average pass rate is higher. As such, males do less worse in environments where performance is historically poor (Hoyer et al., 2020). See Figure A1 of Online Appendix A for a graph showing the relationship between the pass rate of the benchmark group (females) and the observed gender gap. Using a subject by year panel of the gender gap and benchmark pass rate, the results indicate that when the benchmark pass rate increases by 0.1, the gender gap worsens by 0.008 to 0.12.

[23] Table A2 of the Online Appendix shows the gender gap in students outcomes across various subject categories. The results suggest that the largest gender gap in students performance occurred in engineering, arts, and language subjects. Given that only 0.8% of female students sit engineering courses, that result should be interpreted cautiously. The gap in these subject groups were about twice as large as the gender gap observed in science, technology, math, and business subjects.

gap in the pass rate. These results are presented in Table 3. The estimates in column 1 suggest that across all subjects, the unadjusted gap in the pass rate between male and female test-takers is about 8.5 percentage points or approximately 12.88% of the mean pass rate. Several covariates are then added to the model to control for various school-level operational features that may differentially impact the performance of male and female students. These variables include school percentile rank based on historical performance, school percentile rank based on the number of exams taken, and binary variables for academic year, gender mix (coed or not), location (urban or rural), ownership (government or private), and instructional duration (whole-day or shift). Adding these variables to the model slightly narrows the gender gap to 6.9 percentage points or 10.45% of the mean.

Next, several variables are added to the model to account for the composition of test takers. These variables include the cohort size for each subject each year and the share of male test-takers in each cohort. The addition of these covariates will only affect the gender gap if they influence the CSEC outcomes of male and female students differently. For instance, perhaps male students perform better when their subject cohort is male-dominated. There variables had no meaningful impact on the gender gap, which slighly increased to 10.61%. As such, conditioning on these compositional variables have no direct impact on the estimated gender gap.

Since students are allowed to choose their subject concentrations, several variables are then added to the model to assess how students' subject selection behavior impact the gender gap. The decision over the subjects to pursue may influence the gender gap if (a) males and females have strong diverging preferences across subjects and (b) there are systematic differences in the level of difficulty and the pass rate of male- and female-dominated subjects. In order to evaluate the potential influence of such sorting behavior on the observed gender gap in the pass rate, various proxies for subject selection are added to the model. These covariates include (i) fixed effects for the number of CSEC subjects attempted to proxy for students' academic workload, perceived ability, and academic self efficacy;[24] (ii) the mean percentile rank of all CSEC subjects being taken

[24]Since students must be recommended by the teacher for each subject and the pass rate impact teacher's reputation and school rank, the number of subjects taken increases with students ability under this screening mechanism. The

by student i. This serves as a measure of subject difficulty that aims to partial out the gender gap in the pass rate that stems from variations in the difficulty of subjects selected by different genders; (iii) the share of stem subjects taken, and (iv) Indicator variables for the best and worst schools, which take the value 1 if the student is taking subject s at a school that has historically performed in the top or bottom quintile based on the pass rate for that subject.[25] The results in Table 3, column 4 shows that including these variables further reduces the gender gap to 4.8 percentage points or about 7.27%. Adding school by subject fixed effects, a measure of teacher value-added at schools with low teacher turnover, have no further meaningful impact on the gender gap. As such, this approach suggest that over 50% of the conditional gender-gap in student performance cannot be explained by high school attributes, the composition of test-takers, or the the within school behavior of students and teachers.

3.3. Blinder-Oaxaca Decomposition of CSEC Pass Rate

Next, I use the Blinder-Oaxaca decomposition to more thoroughly examine the extent to which the gender gap in the CSEC pass rate can be explained by observed covariates (Blinder, 1973; Jann, 2008; Oaxaca, 1973). This method decomposes the overall gender gap into two components: the portion attributable to differences in these observable characteristics between male and female students (explained component), and the portion of the gap that is attributable to differences in the returns to these characteristics (unexplained component). Using this decomposition, I examine the relative contributions of school-level attributes, the composition of test-takers, and students' subject selection behavior in explaining the gender gap. This highlights areas where policy interventions could be most effective in improving gender parity in CSEC outcomes.

Let X^F and X^M denote the mean of covariate X for males and females, respectively. In addition, let β^F and β^M represent the parameters from the regression $P^j_{ist} = \beta^j_0 + \beta^j X^j + \epsilon^j_{ist}$ where $j = F, M$ and subscripts i, s, and t indexes student, subject, and exam year. Using females

number of CSEC subjects attempted can also serve as a proxy for students' motivation, perceived ability, and their willingness to challenge themselves academically.

[25] In a low turnover environment, this also adjust for teacher's value-added.

performance as the benchmark, the unadjusted gender gap described in section 3 above (β_1) can be decomposed into two components: the portion that can be explained by covariates $(X^F - X^M) \times \beta^F$ and the portion that cannot be explained by included covariates $(\beta^F - \beta^M) \times X^M$. The summary results of the Blinder-Oaxaca decomposition are presented in Table 4, with a detailed breakdown provided in Table A3 of Online Appendix A.[26]

The results show that the covariates explained about 76% of the unadjusted gap in the pass rate of males and females. In particular, the mean differences in school rank, type, location, and ownership explain less than 2% of the gender gap. In comparison, the composition of the test taker population explain about 24.25% of the gender gap, driven by the share of male students taking each subject at each school. As shown in Table 1, this is explained by the sorting of male and female test takers into male-dominated and female-dominated subjects at their school, respectively. Lastly, the number of subjects taken and the historical performance of the school in each selected subject explain about 50% of the difference in male and female students performance. In particular, female students were more likely than male students to take subjects where past students has historically performed well, ranking their school in the top quintile for that subject. This sorting mechanism explains about 22.68% of the gender gap. In addition, on average, female students were observed taking more exams than male students, which explains 31.56% of the difference in pass rate. As discussed above, since teachers recommend students who they believe are more likely to perform well, this variable proxies for students perceived ability, motivation, and academic workload.

As such, the Blinder-Oaxaca decomposition reveals that a significant portion of the gender gap in the CSEC pass rate can be explained by differences in observable characteristics, such as school-level attributes, the composition of test-takers, and students subject selection behavior. However, about a quarter of the gap remains unexplained, suggesting that unobserved variables, such as parental investment, societal expectations, cultural norms, and potential gender biases, may also play a role in influencing student performance. Further research is needed to identify these

[26]Note that $-(X^F - X^M)$ is provided in Table 1.

unobserved factors and develop targeted interventions to achieve full gender parity in educational outcomes.

3.4. Persistent Inequities: From CSEC to CAPE

The CAPE exam is taken by the best performing CSEC students who intend to apply for college. Across all subjects taken over the sample period, about 62.5% of cape test takers were female and 37.5% were male. As such, the share of female test takers is higher at the CAPE level.

Table A4 in Online Appendix A shows that relative to their female peers, male test takers were 6.6 percentage points less likely to pass a generic CAPE subject, 2.7 percentage points less likely to receive the highest possible passing score, and 2.5 percentage points more likely to be absent on test day. These gender disparities are roughly 2 percentage points smaller than those found at the CSEC level. The results also indicate that female test takers continue to outperform male test takers irrespective of school rank, school ownership, subject choice, and subject difficult. As such, even though less lower ability male students advance and sit the CAPE exams, there is still a substantial gender gap in students performance.

Table A5 of Online Appendix A shows the Blinder-Oaxaca decomposition of the gender gap in the CAPE pass rate. For ease of comparison, this decomposition uses the same variables as the CSEC analysis, except for the addition of the CSEC results in the CAPE analysis. The results suggest that 12.77% of the gap can be explained by difference in school-level attributes and school rank (quality) across males and female test takers. For instance, the average percentile rank of schools chosen by females were about 4 points higher than those chosen by males. As such, females were sorting into higher ranked or better performing schools than males. Similar to the CSEC results, the composition of the subject cohort explain about 28.83% of the gender gap. Lastly, subject selection decisions explain about 37% of the gap in the CAPE pass rate. In particular, the number of CSEC subject passed, a measure of ability and preparation, explain about 23.6% of the gender gap. In addition, female test takers were less likely to sit STEM subjects (7%) and were more likely to choose subjects in which their institution historically performed well

(13.08%). Overall, these factors explained about 78.6% of the overall gender gap. While past performance, which was missing from the CSEC analysis, is now included in the CAPE analysis, the observed variables still only explain about two-thirds of the difference in pass rates across genders.

4. Exploring the Gender Gap in College Outcomes

The high school analysis revealed that female students took 59% of CSEC subjects, 62.5% of CAPE subjects, and significantly outperformed their male peers regardless of school rank, school ownership, subject choice, and subject difficulty. These findings indicate that males may face challenges in meeting college admission requirements and may be underrepresented at the best universities. Table 5 shows the gender composition of the new undergraduate and graduate students at the leading university in the Caribbean. The data shows that across all programs at this institution, about 7 in 10 new students were females. As such, one key consequence of the gender disparity in CSEC and CAPE performance is that boys get left behind, an undesirable social outcome which creates a gender imbalance in higher education pursuits.

Table 6 shows the summary statistics for students in their first semester of college. Columns 1 and 2 show the averages for female and male students, respectively and column 3 shows the unadjusted mean differences across gender. The data shows that both males and females had the same average admission scores, with male scores being more clustered in the middle tercile of the admission score distribution than the top or bottom terciles.[27] In addition, there is no statistical difference in the number of CSEC and CAPE subjects passed by admitted male and female students. This suggests that newly admitted male and female students have equivalent past performance or ability. However, with much fewer males than females being admitted, this parity exists because only the highest-performing males have a competitive application.

[27]The university utilizes students CSEC scores to create the admission score. The score increases with the quality of CSEC passes.

4.1. Empirical Model

A simple model is utilized to examine the gender gap in students college GPA:

$$GPA_{smt} = \gamma_0 + \gamma_1 \text{Male}_i + \epsilon_{smt},$$

where the subscripts s, m, and t indexes student, major, and admitted year. The dependent variable P_{ist} measures students' first semester grade point average (GPA). The variable Male_i is a binary variable that takes the value 1 if the student is male and 0 if the student is female, and ϵ_{ist} is the error term representing the omitted factors that may impact students' college performance. In this simple model, γ_1 is the raw average difference in the first semester GPA of male and female students.

4.2. The Gender Gap in College GPA

Table 7 shows how various student-level attributes impact the gender gap in first semester GPA.[28] In particular, this study examines three groups of covariates focusing on college readiness, students' college-level decisions, and field of study chosen. Column 1 begins with the simple model and each group of covariates are then sequentially added.

The first column shows that on average, females had a first semester GPA that was 0.266 points higher than their male peers.[29] Including several proxies for college readiness such as the number of CSEC and CAPE exams passed and college admission score reduces the gap in first semester GPA to 0.210. This suggest that only a small share of the gender gap in college outcomes can be explained by differences in the preparation of incoming students. Next, adding covariates for various college level decisions such as starting age, the number of attempted credits, the number of general education credits, carrying a credit overload, enrollment status, and commuting to campus

[28] See Table A7 in the Online Appendix for equivalent estimates on students GPA across semesters and On-Time Graduation.

[29] Table A6 in Online Appendix A shows that females had a higher first semester GPA than males irrespective of age, enrollment status, and college admission score. In particular, the gap seems larger for students who delayed starting college for 2 years or more, full time students, and for students with admission scores below the median.

further closes the gap slightly to 0.175. As such, these decisions also explain a very small part of the difference in the average performance of male and female students. Lastly, after including field of study, the share of male in each major, a reform that increased the numerical threshold for each letter grade post 2014, tuition, and the total student loan debt, the gap in first semester GPA reduces to 0.024 and becomes statistically insignificant. This indicates that gender differences in the field of study, financing, and composition of selected majors explain a significant share of the gap in students college outcomes.

4.3. Blinder-Oaxaca Decomposition of College GPA

Similar to the previous analysis, the Blinder-Oaxaca decomposition was also utilized to examine how each variable contribute to the gender gap in first-semester GPA. The results are presented in Table 8. The decomposition shows that the college readiness covariates explain about 24% of the gender gap in first semester GPA. This is explained by differences in the admission score (quality of CSEC passes) and number of advanced proficiency exams that were successfully completed by incoming male and female students. As such, the disparity in academic preparedness contribute a significant share to the overall gender gap in first semester GPA, highlighting the importance of fostering gender parity in pre-college academic outcomes.

The results also suggest that various college level decisions, such as age, the number of attempted credits, the number of general education credits, carrying a credit overload, enrollment status, and commuting status had a small impact on the gender gap. These factors jointly explain less than 1% of the gap in first semester GPA. Lastly, the results show that the field of study covariates explain about 76.5% of the gender gap. In particular, the program of study selected by male and female students explain about 46.3% of the gender gap. For example, Table 6 shows that among new male students, 40.7% and 37.4% chose majors in the Social Science and Science and Technology faculties, respectively. In comparison, 38.9% and 20.9% of female students chose majors in these faculties. As such, males students were about 16.5 percentage point more likely to choose majors in Science and Technology, and 1.8 percentage points more likely to choose majors in the Social Science faculty. On the other hand, female students were more likely to choose majors in the Humanities and Education (4.4 percentage points), Law (1.2 percentage points), and Medical Science (12.7 percentage points) colleges. Lastly, the gender composition of majors each year explained about 32% of the observed difference between male and females first semester GPA. In this light, the descriptive statistics show that similar to their female peers, males were more likely to choose majors with a higher share of their own gender. However, the results suggest that student loan debt, tuition, and a grade reform that increased the difficulty of each course jointly explained less than 2 percent of the gender gap.

5. Conclusion

The analysis revealed several insightful findings about the gender disparity in educational outcomes in Jamaica. First, female students performed better than their male peers in both standardized high school exams. For instance, female students were 8.5 and 6.6 percentage points more likely to pass a generic subject in the CSEC and CAPE exams, respectively. These findings are consistent with the results from various sub-group analysis conducted across subject type, school ownership, school rank, and subject difficulty. The sub-group analyses further revealed that the gender gap was larger at high-ranked schools and in non-STEM and easier CSEC subjects.

Second, this study finds that the gender composition of the test taking cohort and students' subject selection behavior explain about 76% of the observed gender gap in the CSEC pass rate. Notably, the sorting of students into subjects based on the historical performance of their high school, along with differences in the average number of subjects taken across genders (a proxy for ability and motivation), are major contributors. On the other hand, the findings show that school rank (13%), the gender and size composition of the test taking cohort (30%), past academic performance (26%), and students sorting into subjects based on the historical performance of their high school (13%) explain about 78% of the gender gap in the CAPE past rate. Consequently, more than 20% of the gender gap in CSEC and CAPE past rates remain unexplained, suggesting that unobserved factors such as studying behavior and cultural norms may play a significant role.

Third, the data suggests that the majority of incoming students at the leading university in the Caribbean are female, and regardless of the age at entry, enrollment status, or admission scores, female students continue to outperform their male peers at this level. Using the Blinder-Oaxaca decomposition, I found that college readiness, college-level decisions, and field of study fully explain the difference in college GPA across gender. These findings underscore the importance of addressing pre-college gaps in academic performance and gender-specific preferences in subject/major selection to reduce the gender gap in higher education outcomes.

These results are important as they demonstrate that in Jamaica, males are now accumulating human capital at a significantly lower rate than females, a pattern that is now being documented in technical reports across Latin America and Caribbean region (Abdulkadri et al., 2022; Buitrago-Hernandex et al., 2023; Thailinger et al., 2023). Given these findings, policymakers should now consider how to address this gender disparities in educational outcomes. The results suggest several policy response that could effectively promote gender parity without hurting the performance of girls. First, increasing academic support and advising programs for low-performing students could help reduce the gender gap in high school outcomes. This could help navigate lower performing males from traditionally challenging subjects and provide greater support for the students who do choose these subjects. Second, promoting gender-neutral subject selection by providing equal encouragement and resources for both male and female students to explore a diverse range of subjects could help mitigate the sorting behavior observed in the study and reduce the performance gap that is due to subject choice. Third, to achieve long-term gender parity in academic outcomes, policymakers must address the broader societal and cultural norms that create restrictive gender roles and expectations in education. For instance, policymakers can promote gender-sensitive educational practices by training teachers to recognize and counteract gender biases, and fostering an inclusive school environment that supports all students equally. Lastly, policymakers should also consider adopting measures to support male students' transition to higher education. This could include using orientation, academic advising, and peer support networks to encourage more males to apply and enroll in higher education.

By implementing these strategies, policymakers can work towards achieving a more balanced and equitable educational landscape, ensuring that both male and female students have equal opportunity to succeed.

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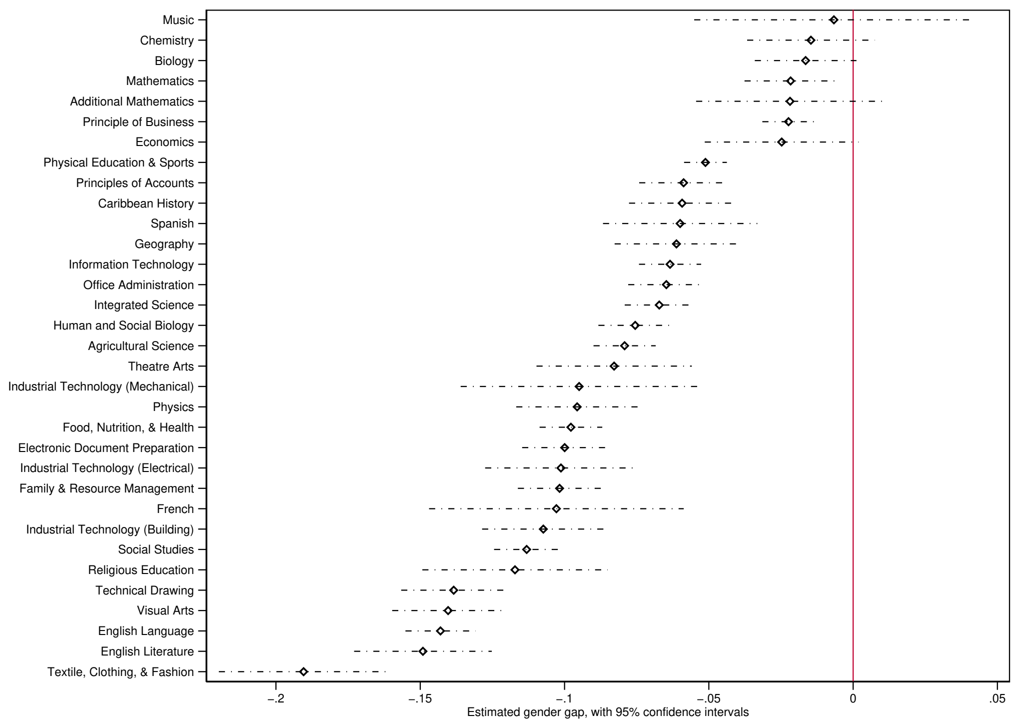
Appendix: Figures and Main Tables

Fig 1: CSEC Subject-Level Gender Gaps



Notes: **The figure shows the gender gap in each subject.**

Table 1: Descriptive Statistics, CSEC Exam

	Female (X^F)	Male (X^M)	($X^M - X^F$)
Panel A: Exam Outcomes			
Pass Exam	0.692	0.607	-0.085** (0.015)
Top Score	0.156	0.110	-0.046** (0.012)
Absent	0.049	0.090	0.041** (0.008)
Panel B: School Attributes			
School Percentile Ranking (Performance)	63.34	61.10	-2.24** (0.60)
School Percentile Ranking (# Sitting)	73.91	74.15	0.24 (0.37)
Co-ed	0.788	0.841	0.053** (0.010)
Whole-Day	0.771	0.768	-0.002 (0.005)
Urban	0815	0.819	0.004 (0.004)
Government Owned	0.618	0.010	0.009 (0.010)
Panel C: Class Composition			
Cohort Size (# Sitting)	108.64	110.43	1.80 (5.50)
Male Share in each cohort	0.287	0.583	0.296** (0.034)
Panel D: Subject Selection			
Subject Difficulty Index	45.39	42.99	2.41** (0.25)
School in Top Subject Quintile	0.322	0.236	0.086** (0.022)
School in Bottom Subject Quintile	0.101	0.107	0.005** (0.006)
STEM Share	0.417	0.517	0.100** (0.012)
Technology	0.137	0.141	0.008 (0.009)
Engineering	0.008	0.109	0.089 (0.049)
Math	0.062	0.065	-0.002 (0.011)
Nutrition and Sports	0.101	0.069	-0.026 (0.031)
Business	0.153	0.121	-0.031 (0.017)
Arts	0.161	0.133	-0.031 (0.019)
Language	0.168	0.160	-0.005 (0.016)
Share Taking 2 Subjects	0.050	0.061	0.011 (0.003)
Share Taking 3 Subjects	0.044	0.068	0.024** (0.003)
Share Taking 4 Subjects	0.052	0.083	0.031** (0.003)
Share Taking 5 Subjects	0.079	0.108	0.029** (0.003)
Share Taking 6 Subjects	0.116	0.136	0.020** (0.003)
Share Taking 7 Subjects	0.172	0.170	-0.002 (0.004)
Share Taking 8 Subjects	0.321	0.254	-0.068** (0.008)
Share Taking 9 Subjects	0.101	0.064	-0.036** (0.004)
Share Taking 10+ Subjects	0.025	0.018	-0.007** (0.003)
Observations	1,458,355	1,004,889	2,463,244

Notes. The table presents the average characteristics of students taking the standardized CSEC exam. Column 1 and 2 shows the average of each covariate for females and males, respectively and column 3 show the unadjusted gender gap. Standard errors are two-way clustered at the subject by exam year level for all high school outcomes and at the major by admission year level for all college outcomes. The clustered standard errors are presented in parenthesis beside each estimate. *P < 0.05, **P < 0.01.

Table 2: Gender Gap in CXC Pass Rate, Sub-Group Analysis

		School Rank		Ownership		Subject Choice		Subject Difficulty	
	Total	High Ranked	Low Ranked	Government Owned	Privately Owned	STEM	Non-STEM	Easier subjects	Harder subjects
Pass	-0.085**	-0.090**	-0.063*	-0.086**	-0.082**	-0.037*	-0.11**	-0.082**	-0.064**
	(0.015)	(0.012)	(0.024)	(0.019)	(0.010)	(0.017)	(0.021)	(0.015)	(0.020)
Top Score	-0.046**	-0.061**	-0.002	-0.029*	-0.073**	-0.032*	-0.052*	-0.053**	-0.029**
	(0.012)	(0.014)	(0.006)	(0.010)	(0.016)	(0.011)	(0.018)	(0.016)	(0.009)
Absent	0.041**	0.036**	0.051**	0.047**	0.030**	0.045**	0.035**	0.045**	0.037**
	(0.008)	(0.005)	(0.010)	(0.009)	(0.005)	(0.011)	(0.007)	(0.006)	(0.010)
Observations	2,463,244	1,796,327	666,917	1,531,345	931,899	1,128,282	1,334,962	1,296,850	1,166,394
Avg Pass Rate	0.66	0.73	0.45	0.77	0.59	0.60	0.71	0.76	0.54

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by school rank, ownership, subject choice, and subject difficulty. The average pass rate across all subjects in each sub sample are presented in the bottom panel.

Table 3: Conditional Gender Gap in the CXC Pass Rate

Male	-0.085**	-0.068**	-0.070**	-0.048**	-0.050**
	(0.015)	(0.016)	(0.017)	(0.015)	(0.014)
School Attributes	×	✓	✓	✓	✓
Student Composition	×	×	✓	✓	✓
Subject Selection	×	×	×	✓	✓
School x Subject FE	×	×	×	×	✓
Observations	2,442,764	2,442,764	2,442,764	2,442,764	2,442,764
% of Mean Pass Rate	-12.88%	-10.45%	-10.61%	-7.27%	-7.58%

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in pass rate across several model specifications. The final model includes schools percentile rank, subject cohort size, and the number of exams taken as controls for school quality and student effort.

Table 4: Blinder-Oaxaca Decomposition of Gender Gap

	Partial Explained Variation	**Total Explained Variation**
Panel A: School Attributes		**1.87%**
School Rank	6.05%	
School Operational Features	-4.18%	
Panel B: Student Composition		**24.25%**
Cohort Size (# Sitting)	-0.06%	
Male Share in each cohort	24.31%	
Panel C: Subject Selection		**49.95%**
Subject Difficulty Index	0.56%	
School Performance in Subject	22.68%	
STEM Subject Choice	-4.85%	
Number of Subjects Taken	31.56%	
% of Gender Gap Explained		**76%**

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by school rank, ownership, subject choice, and subject difficulty. The average pass rate across all subjects in each sub sample are presented in the bottom panel.

Table 5: Gender Gap in College Entry

	Humanities & Education	Social Sciences	Science & Technology	Medical Sciences	Law	Total Enrolled
Undergraduate:						
Number of Males	1,341	3,835	3,525	372	349	9,447
Number of Females	4,205	8,754	4,710	3,767	1,097	22,621
Total Enrolled	5,546	12,589	8,235	4,139	1,446	32,068
Male Share	24.18%	30.46%	42.81%	8.99%	24.14%	29.46%
Graduate:						
Number of Males	497	1,264	414	721		2,899
Number of Females	2,020	2,572	370	1,773		6,735
Total Enrolled	2,517	3,836	784	2,494		9,634
Male Share	19.15%	32.95%	52.81%	28.91%		30.09%

Notes. *P < 0.05, **P < 0.01. Heteroskedastic- robust standard errors are presented in paranthesis below each estimate. All specifications include cohort (subject by year) fixed effects. The estimates show the male-female gap in performance by school type, ownership, rank, and subject difficulty.

Table 6: Entering College Students Descriptive Statistics

	Female (X^F)	Male (X^M)	($X^M - X^F$)
Panel A: College Performance			
GPA	2.108	1.844	-.266** (0.058)
Ontime Graduation	0.296	0.186	-0.138** (0.022)
Panel B: College Readiness			
Admission Score, Bottom Tercile	0.324	0.281	-0.042 (0.046)
Admission Score, Middle Tercile	0.307	0.406	0.099** (0.014)
Admission Score, Top Tercile	0.369	0.313	-0.057 (0.041)
Admission Score	34.22	34.39	0.14 (1.61)
Number of CSEC Passes	7.536	7.473	-0.068 (0.089)
Number of CAPE Passes	5.106	5.534	0.423 (0.356)
Panel C: College Decisions			
Credits Attempted	14.049	14.230	0.175 (0.346)
Credits Overload	0.273	0.299	0.025 (0.061)
Core Credits	2.620	2.166	-0.458 (0.284)
Full Time	0.824	0.825	-0.0001 (0.020)
Commuting Status	0.792	0.780	-0.012 (0.012)
Age	21.769	20.991	-0.769 (0.382)
Panel D: Field of Study Details			
Male Share	0.257	0.400	0.143* (0.040)
Tuition	1098.88	1135.34	35.19 (26.89)
Grade Reform	0.295	0.311	0.016** (0.001)
Need-Based Student Loan	363.32	297.678	-66.27 (31.11)
Humanities and Education	0.187	0.142	-0.044 (0.047)
Law	0.049	0.037	-0.012 (0.015)
Medical Science	0.167	0.039	-0.127 (0.125)
Science and Technology	0.209	0.374	0.165 (0.108)
Social Sciences	0.389	0.407	0.018 (0.093)
Observations	22,518	9,439	31,932

Notes. The table presents the average characteristics of students taking the high school exit exam and entering the top university in Jamaica. These averages are presented by gender and the results of a simple regression of a male dummy on each characteristics is shown in the last column. Standard errors are two-way clustered at the subject by exam year level for all high school outcomes and at the major by admission year level for all college outcomes. The clustered standard errors are presented in parenthesis beside each estimate. *P < 0.05, **P < 0.01.

Table 7: Conditional Gender Gap in College GPA

First Semester GPA	-0.266**	-0.210*	-0.175	-.024
	(0.058)	(.078)	(0.087)	(0.041)
Admit Year FE	×	✓	✓	✓
College Readiness	×	✓	✓	✓
College Decisions	×	×	✓	✓
Field of Study	×	×	×	✓
Observations	31,932	31,932	31,932	31,932

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the major and admission year level and presented in parenthesis below each estimate. The estimates show the male-female gap in entering students first semester GPA across several model specifications. The pre-college attributes include high school fixed effects, college admission score, number of CXC exams passed, and parish of permanent residence. The college level decisions include total attempted credits, mandatory general education credits, enrollment status, and on-campus housing status.

Table 8: Blinder-Oaxaca Decomposition of College GPA

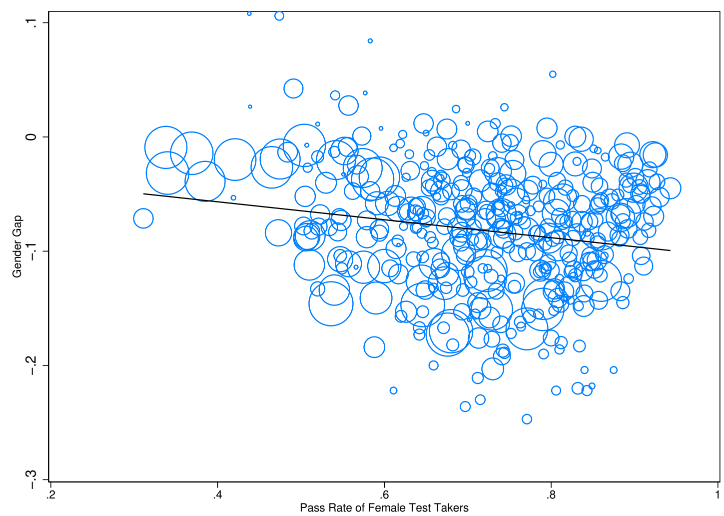
	Partial Explained Variation	Total Explained Variation
Panel A: College Readiness		**23.97%**
Admission Score	14.47%	
Number of CSEC Passes	1.08%	
Number of CAPE Passes	8.42%	
Panel B: College Decisions		**0.63%**
Credits Attempted	-2.25%	
Credit Overload	1.24%	
Core Credits	-1.59%	
Full Time	0.01%	
Commuter	0.13%	
Start Age	3.09 %	
Panel C: Field of Study Details		**76.51%**
Program of Study	46.29%	
Male Share	31.95%	
Grade Reform	-1.37%	
Tuition	-0.95%	
Need-Based Student Loan	0.59%	
% of Gender Gap Explained		**100%**

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by school rank, ownership, subject choice, and subject difficulty. The average pass rate across all subjects in each sub sample are presented in the bottom panel.

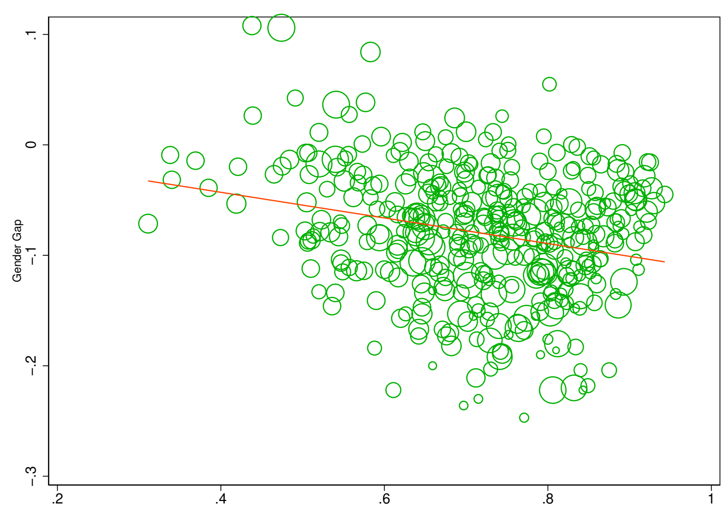
Online Appendix A: Additional Figures and Tables

Fig A1: Females Pass Rate and the Gender Gap

(a) Weighted by Subject Cohort Size



(b) Weighted by Male Share



Notes: **The figure shows how the gender gap varies with the pass rate of female test-takers in each subject. The pass rate of female test-takers is a proxy for subject difficulty, since female is the benchmark group with the highest performance across subjects. Panel A is weighted by the number of takers in each subject relative to the total number of exams taken. Panel B is weight by the share of male students in each subject. The slope range from -0.12 to -0.08.**

Table A1: Descriptive Statistics, CAPE Exam

	Female (X^F)	Male (X^M)	($X^M - X^F$)
Panel A: Exam Outcomes			
Pass Exam	0.864	0.798	-0.066** (0.012)
Top Score	0.090	0.063	-0.027* (0.010)
Absent	0.045	0.069	0.024** (0.002)
Panel B: School Attributes			
School Ranking (Performance)	68.50	64.40	-4.10* (0.97)
School Ranking (# Sitting)	79.53	79.18	-0.346 (0.372)
Co-ed	0.866	0.908	0.041** (0.007)
Government Owned	0.297	0.322	0.025* (0.007)
Panel C: Class Composition			
Cohort Size (# Sitting)	54.29	51.54	-2.75 (1.62)
Male Share in each cohort	0.242	0.597	0.355** (0.022)
Panel D: Subject Selection			
Subject Difficulty Index	45.29	45.73	0.45 (0.17)
School in Top Subject Quintile	0.266	0.120	-0.15** (0.016)
School in Bottom Subject Quintile	0.186	0.207	0.021 (0.009)
STEM Share	0.258	0.367	0.11 (0.05)
Number of CSEC Subjects Taken	6.07	5.90	-0.17* (0.009)
Number of CSEC Subjects Passed	5.57	5.23	-0.34** (0.06)
Number of CAPE Subjects Taken	4.07	0.065	0.030 (0.022)
Observations	178,045	106,913	284,958

Notes. The table presents the average characteristics of students taking the standardized CAPE exam. Column 1 and 2 shows the average of each covariate for females and males, respectively and column 3 show the unadjusted gender gap. Standard errors are two-way clustered at the subject by exam year level for all high school outcomes and at the major by admission year level for all college outcomes. The clustered standard errors are presented in parenthesis beside each estimate. *P < 0.05, **P < 0.01.

Table A2: Gender Gap in Performance by Subject Type

	Pass	**Top Score**	**Absent**
Science	-0.061**	-0.034**	0.039**
	(0.010)	(0.006)	(0.007)
Technology	-0.063**	-0.055**	0.038**
	(0.006)	(0.008)	(0.004)
Engineering	-0.12**	-0.080**	0.050**
	(0.011)	(0.021)	(0.009)
Math	-0.020*	-0.008	0.014**
	(0.004)	(0.022)	(0.003)
Nutrition, Sports, & Entertainment	-0.084	0.042	0.081**
	(0.050)	(0.065)	(0.018)
Business	-0.051*	-0.061*	0.030*
	(0.017)	(0.015)	(0.008)
Arts	-0.13**	-0.054	0.037**
	(0.016)	(0.026)	(0.003)
Language	-0.13**	-0.087*	0.022**
	(0.016)	(0.017)	(0.002)

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by subject classification.

Table A3: Detailed Blinder-Oaxaca Decomposition of Gender Gap in CXC Pass Rate

	Female (β^F)	Male (β^M)	$(X^F - X^M) \times \beta^F$	$(\beta^F - \beta^M) \times X^M$	**Explained**
Panel A: School Attributes					**1.87%**
School Performance Rank	0.00219	0.00214	0.0049	0.00306	5.77%
School Percentile Rank (# Sitting)	-0.0010	-0.0014	0.00024	0.0311	0.28%
Co-ed	0.0639	0.0177	-0.0034	0.0389	-3.98%
Whole-Day	-0.00747	-0.00698	-0.000015	-0.000376	-0.02%
Urban	0.00521	0.0106	-0.000021	-0.00441	-0.02%
Government Owned	0.0143	0.0195	0.00013	-0.00326	-0.15%
Panel B: Class Composition					**24.25%**
Cohort Size (# Sitting)	0.0000278	-0.000971	-0.000050	0.0138	-0.06%
Male Share in each cohort	-0.0698	0.0686	0.0207	-0.0807	24.31%
Panel C: Subject Selection					**49.85%**
Subject Difficulty Index	0.000339	0.000319	0.000477	0.000875	0.56%
School in Top Subject Quintile	0.202	0.207	0.0174	-0.00118	20.44%
School in Bottom Subject Quintile	-0.318	-0.243	0.00191	-0.00803	2.24%
STEM Share	0.0412	0.0384	-0.00412	0.00145	-4.85%
Share Taking 2 Subjects	-0.0817	-0.0999	0.00092	0.00112	1.10%
Share Taking 3 Subjects	-0.161	-0.140	0.0038	-0.00143	4.47%
Share Taking 4 Subjects	-0.163	-0.110	0.0050	-0.00440	5.91%
Share Taking 5 Subjects	-0.104	-0.0495	0.0030	-0.00589	3.57%
Share Taking 6 Subjects	-0.0215	0.0293	0.00043	-0.00691	0.51%
Share Taking 7 Subjects	0.0495	0.107	0.000099	-0.00978	0.12%
Share Taking 8 Subjects	0.107	0.171	0.0072	-0.0163	8.43%
Share Taking 9 Subjects	0.141	0.219	0.0052	-0.00502	6.07%
Share Taking 10+ Subjects	0.167	0.258	0.0012	-0.00166	1.39%
% of Gender Gap Explained			**0.0646**	**0.0205**	**76%**

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by school rank, ownership, subject choice, and subject difficulty. The average pass rate across all subjects in each sub sample are presented in the bottom panel.

Table A4: Gender Gap in CAPE Pass Rate, Sub-Group Analysis

		School Rank		Ownership		Subject Choice		Subject Difficulty	
	Total	High Ranked	Low Ranked	Government Owned	Privately Owned	STEM	Non-STEM	Easier subjects	Harder subjects
Pass	-0.066**	-0.052**	-0.0651*	-0.070**	-0.062**	-0.058*	-0.059**	-0.051**	-0.074**
	(0.012)	(0.009)	(0.017)	(0.012)	(0.012)	(0.018)	(0.006)	(0.004)	(0.015)
Top Score	-0.027*	-0.033	-0.001	-0.007	-0.034*	-0.031**	-0.030*	-0.042*	-0.011
	(0.010)	(0.015)	(0.003)	(0.006)	(0.012)	(0.007)	(0.012)	(0.012)	(0.006)
Absent	0.025**	0.016**	0.025**	0.032**	0.021**	0.027**	0.023**	0.023**	0.026**
	(0.002)	(0.002)	(0.005)	(0.004)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	284,958	161,146	123,812	197,686	87,272	85,124	199,834	143,446	141,512
Avg Pass Rate	0.84	0.91	0.74	0.82	0.85	0.79	0.86	0.91	0.77

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by school rank, ownership, subject choice, and subject difficulty. The average pass rate across all subjects in each sub sample are presented in the bottom panel.

Table A5: Blinder-Oaxaca Decomposition of the Gender Gap in CAPE Pass Rate

	Partial Explained Variation	Total Explained Variation
Panel A: School Attributes		**12.77%**
School Rank	13.09%	
School Operational Features	-0.32%	
Panel B: Student Composition		**28.83%**
Age in exam year	-1.68%	
Cohort Size (# Sitting)	2.77%	
Male Share in each cohort	27.74%	
Panel C: Subject Selection		**37.03%**
Subject Difficulty Index	1.59%	
School Performance in Subject	13.08%	
STEM Subject Choice	7.00%	
Number of CSEC Subjects Taken	-10.82%	
Number of CSEC Subjects Passed	23.63%	
Number of CAPE Subjects Taken	2.53%	
% of Gender Gap Explained		**78.63%**

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by school rank, ownership, subject choice, and subject difficulty. The average pass rate across all subjects in each sub sample are presented in the bottom panel.

Table A6: Heterogeneity, Gender Gap in Students College Performance

		Age		**Enrollment Status**		**Admission Score**	
	Total	Age 16-19	Age 20+	Part Time	Full Time	Lower Scores	Higher Scores
GPA	-0.266**	-0.198*	-0.375*	-0.255	-0.265**	-0.407*	-0.090
	(0.058)	(0.054)	(0.110)	(0.119)	(0.052)	(0.138)	(0.044)
On-Time Grad	-0.138**	-0.132**	-0.149*	-0.078	-0.151**	-0.166*	-0.098**
	(0.022)	(0.018)	(0.045)	(0.043)	(0.025)	(0.055)	(0.012)
Observations	31,932	19,376	12,556	5528	26,404	15,740	16,192

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the subject and exam year level and presented in parenthesis below each estimate. The estimates show the male-female gap in performance by school rank, ownership, subject choice, and subject difficulty. The average pass rate across all subjects in each sub sample are presented in the bottom panel.

Table A7: Gender Gap in College Outcomes by Student-Level Attributes

All Semester GPA	-0.265**	-0.227*	-0.223*	0.012
	(0.058)	(.072)	(0.068)	(0.059)
On-Time Grad	-0.138**	-0.122**	-0.105**	-.042*
	(0.022)	(.023)	(0.025)	(0.011)
Admit Year FE	×	✓	✓	✓
Pre-College Attributes	×	✓	✓	✓
College Decisions	×	×	✓	✓
Major Choice	×	×	×	✓
Observations	25,176	25,176	25,176	25,176
% of Mean GPA	-12.81%	-10.84%	-8.87%	-1.48%

Notes. *P < 0.05, **P < 0.01. Standard errors are two-way clustered at the major and admission year level and presented in parenthesis below each estimate. The estimates show the male-female gap in entering students first semester GPA across several model specifications. The pre-college attributes include high school fixed effects, college admission score, number of CXC exams passed, and parish of permanent residence. The college level decisions include total attempted credits, mandatory general education credits, enrollment status, and on-campus housing status.

Online Appendix B: Variable Creation and Definition

In this section, I also provide details about each variable utilized in the analysis to ensure readers can properly interpret the main results and to facilitate any future attempt to replicate the study.

Dependent Variables: CSEC Exam

The CSEC exam is graded on a 6-point scale from I to VI, with I being the best performance and VI the worst.

Pass Exam

For a generic subject, this binary variable is assigned the value 1 if the result was grades I, II, or III, and 0 otherwise.

Top Score

For a generic subject, this binary variable is assigned the value 1 if the student obtained grade I, and zero otherwise.

Absent

For a generic subject, this binary variable is assigned a value of 1 if the student was absent on exam day, resulting in a grade of "Abs", and 0 otherwise.

CSEC Subjects

There are 33 CSEC subjects offered by the Caribbean Examination Council. These include Additional Mathematics, Agricultural Science; Biology; Caribbean History; Chemistry; Economics; Electronic Document Preparation; English Language; English Literature; Family & Resource Management; Food, Nutrition, & Health; French; Geography; Human and Social Biology; Industrial Technology (Building); Industrial Technology (Electrical); Industrial Technology (Mechanical); Information Technology; Integrated Science; Mathematics; Music; Office Administration; Physical Education & Sports; Physics; Principles of Accounts; Principle of Business; Religious Education; Social Studies; Spanish; Technical Drawing; Textile, Clothing, & Fashion; Theatre Arts; Visual Arts.

Dependent Variables: CAPE Exam

The CAPE exam is graded on a 7-point scale from I to VII, with I being the best performance and VII the worst.

Pass Exam

For a generic subject, this binary variable is assigned the value 1 if the result was grades I, II, III, IV, or V, and 0 otherwise.

Top Score

For a generic subject, this binary variable is assigned the value 1 if the student obtained grade I, and zero otherwise.

Absent

For a generic subject, this binary variable is assigned a value of 1 if the student was absent on exam day, resulting in a grade of "Abs", and 0 otherwise.

CAPE Subjects

There were 33 CAPE subjects over the sample period: Accounting; Agricultural Science; Applied Mathematics; Art and Design; Biology; Building and Mechanical Engineering; Caribbean Studies; Chemistry; Communication Studies; Computer Science; Digital Media; Economics; Electrical and Electronic Technology; Entrepreneurship; Environmental Science; Food and Nutrition; French; Geography; Geometrical and Mechanical Engineering; History; Information Technology; Integrated Mathematics; Law; Literatures in English; Logistics and Supply Chain Operations; Management of Business; Performing Arts; Physical Education and Sport; Physics; Pure Mathematics; Sociology; Spanish; Tourism

School-Level Attributes

The school-level attributes utilized in the CSEC and CAPE analyses are equivalent.

School Percentile Ranking (Performance)

The administrative data for both the CSEC and CAPE exams provided a detailed account of all exams taken and the respective schools where students took these exams This data was utilized to create annual school performance rankings. To establish these rankings, the percentage of students achieving passing and top scores at each institution each year was first calculated. For each metric, schools were then sorted based on their performance levels from lowest to highest and the corresponding percentile rank were subsequently calculated. The average of these two ranking variables was used. For instance, if a hypothetical high school achieved the highest pass rate across all subjects and ranked in the 94th percentile for top scores, its overall percentile rank for that year would be 97. This rank was then assigned to all students taking subjects at that institution.

School Percentile Ranking (# Sitting)

This is calculated similar to the variable above. The main difference is that schools are sorted based on the total number of exam taken across all subjects.

Co-education Schools

This binary variable is assigned a value of 1 if the student is attending a co-education school (both genders attend) and 0 if the institution is an all-boy or all-girl school.

Whole Day Schools

This binary variable is assigned a value of 1 if the student is attending a full day school and 0 if the institution operates on a shift system.

Urban Schools

This binary variable is assigned a value of 1 if the student's school is located in the urban area and 0 if it is located in the rural area.

Government Owned Schools

This binary variable is assigned a value of 1 if the student's school is owned by the government and 0 if it is privately owned.

Cohort Composition and Subject Difficulty

The term 'cohort' describes all students at a generic school who sit subject j in year t."

Cohort Size

Cohort size measures the number of students at school s who sat subject j in year t.

Male Share in each Cohort

This variable represents the share of males in each cohort, calculated as the number of males in the cohort divided by the total cohort size.

Number of Subjects Taken

This is defined as the total number of CSEC or CAPE subjects taken, irrespective of the results received.

STEM Share

For each student, this variable represents the share of subjects with a STEM designation, calculated as the number of STEM subjects taken divided by the total number of subjects taken.

School in Top/Bottom Subject Quintile

For each subject j taken at school s, the Top (Bottom) Subject Quintile variable is assigned a value of 1 if the school's average pass rates place them among the top (bottom) 20 percent of schools in that subject and 0 otherwise. This is calculated by finding the average pass rate in each subject at each school over the sample period. Schools are then sorted within each subject, and their subject-specific percentile rank is calculated.

Subject Difficulty Index

This is calculated by finding the average pass rate by subject each year. Subjects are sorted by the average pass rate each year and their percentile rank is calculated such that easier subjects (those with higher pass rates) have have a higher value. As such, each subject would be assigned a percentile rank each year. This is then averaged across the subjects taken by each students. For instance, assume that Jason Taylor takes three subjects: Mathematics, Social Studies, and Chemistry in 2015. Assume that these subjects had percentile ranks 6, 88, and 15 in that year. Then the average difficulty of the courses taken by John would be 36.

College Variables

Admission Score

The University of the West Indies calculates an admission score for all students using the CSEC exam results. This score increases with the quality of CSEC passes.

Attempted Credits

This refers to the total number of credits a student has registered for during the semester.

Core Credits

This refers to the total number of credits for general education courses the student is required to complete.

Credit Overload

This binary variable is assigned a value of 1 if the student has more than the 15 credits as recommended by the university and 0 otherwise.

Enrolment Status

Full Time is a binary variable assigned a value of 1 if the student is registered as full-time and 0 if registered as part-time.

Commuter

This binary variable is assigned a value of 1 if the student lives off campus and commutes, and 0 otherwise.

Start Age

This variable captures the student's age in their first semester.

Male Share in each Major

This variable represents the share of males in each major among new students each year.